REMARKS

The specification has been reviewed, and clerical errors of the specification have been amended.

On page 2 of the Action, the drawings were objected to because of the informalities in Figures 20 to 24. In view of the objection, Figures 20 to 24 have been amended to correct the informalities. Figures 4A to 4E, 5A and 5B, and 19A to 19C also have been amended to correct informalities.

On page 2 of the Action, claims 3 and 4 were objected to because of the informalities. In view of the objection, claims 3 and 4 have been amended to correct the informalities.

On page 2 of the Action, claims 1-3, 10-11 and 14-15 were rejected under 35 U.S.C. 102(a) as being anticipated by Kagaku et al. (JP 10-300420 A). Further, on page 3 of the Action, claims 4-6 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kagaku et al. (JP 10-300420 A). In view of the rejections, claims 1 and 14 have been amended to include additional limitations disclosed in the specification of the invention. Claim 10 has been amended to include the limitations of claims 11 and 12, and claims 11 and 12 have been canceled. Claims 2, 5-9 and 15 have been amended to correct clerical errors. Claim 13 has been canceled. Also, new claim 16 has been filed. Claim 16 is readable on the elected species B.

As recited in claim 1, an apparatus of the invention measures displacement of a surface of a measuring object. The apparatus comprises projecting means and light receiving means. The projecting means has one convergent lens and scans radiated light on the surface of the measuring object through the convergent lens to form an irradiation point on the surface of the measuring object. The light receiving means includes a light receiving element with a light receiving plane for receiving measuring beams reflected at the irradiation point to form an image formation point on the light receiving plane; a lens array composed of plural condenser lenses having a uniform image formation characteristic around an optical axis thereof and arranged in a scanning direction of the radiated light for converging the measuring beams reflected at the irradiation point; and an imaging lens having a uniform image

formation characteristic around an optical axis thereof for converging the measuring beams passing through the lens array to form the image formation point on the light receiving plane. Accordingly, an amount of the displacement on the surface of the measuring object is obtained by using triangulation of light reflected on the surface of the measuring object after passing though the convergent lens, passing through the lens array and imaging lens, and forming the image formation point on the light receiving plane, and a signal different according to a location of the image formation point on the light receiving plane.

In particular, in the apparatus of the invention, the projecting means scans the radiated light through the one convergent lens to form the irradiation point on the surface of the measuring object. The light reflected at the irradiation point is converged through the lens array composed of the plural condenser lenses, and the imaging lens further converges the measuring beams passing through the lens array to form the image formation point on the light receiving plane of the light receiving element. Accordingly, the apparatus of the invention can obtain an amount of the displacement of the surface of the measuring object using triangulation of light.

Kagaku et al. cited in the Action relates to a method of measuring multi-point displacements using a micro-lens array. As shown in Fig. 1 of Kagaku et al., a laser source 1 irradiates a leaser beam. The leaser beam is incident on a measuring object 5 through an audio-optical polarizer 2, a lens 3, a beam splitter 6 and a micro-lens array 4. The laser beam reflected from the measuring object 5 is received on a light detector 7 through the micro-lens array 4 and the splitter 6.

In Kagaku et al., the laser beam is irradiated on the measuring object 5 through the splitter 6 and the micro-lens array 4, and the laser beam reflected from the measuring object 5 returns to the micro-lens array 4 and the splitter 6 passing through the same path. In Kagaku et al., according to a position of the measuring object 5, a different image is formed in the light detector 7, as shown in Fig. 3, thereby determining the displacement of the measuring object.

Accordingly, in Kagaku et al., the displacement of the measuring object is not determined by triangulation of light. In the invention, the apparatus uses triangulation of light to determine the displacement of the measuring object.

In Kagaku et al., the laser beam passes through the micro-lens array twice, i.e. before incident on the measuring object and after reflected from the measuring object. Accordingly, it is possible to measure the displacement of the measuring object at multi-points spaced apart by a distance only equal to or larger than a pitch of the micro-lens array. In other words, in Kagaku et al., resolution of the measurement is limited to the pitch of the micro-lens array.

In the invention, the projecting means scans the radiated light on the surface of the measuring object only through the one convergent lens. Accordingly, the radiated light is converged at a single point on the surface of the measuring object through the one convergent lens. Therefore, in the invention, it is possible to obtain high resolution without being limited by the pitch of the lens array.

Therefore, the features of the invention are not disclosed or suggested in Kagaku et al.

Claim 10 includes the limitations of claims 11 and 12. Since claim 10 includes the subject matter of claim 12 which was not rejected in the Action, claim 10 should be allowable.

In claim 14 of the invention, a method for measuring displacement includes scanning light on a surface of a measuring object through one convergent lens to form an irradiation point on a surface of the measuring object; converging the light from the irradiation point by a lens array composed of plural condenser lenses having a uniform image formation characteristic around an optical axis thereof and arranged in a scanning direction of the light; forming an image formation point on a light receiving plane of a light receiving element by an image lens; detecting a deviation of the image formation point on the light receiving plane of the light receiving element by using a reference object; correcting an amount of the displacement based upon the deviation; and measuring the amount of the displacement of the surface of the

measuring object using triangulation of light without contact based upon the deviation of the image formation point.

In Kagaku et al., the laser beam or light passes through the same path between the splitter 6 and the measuring object 5 through the micro-lens array 4, thereby not using triangulation of light. In claim 14 of the invention, the method measures the displacement by using triangulation of light, and the light passes through different paths to and from the measuring object. Further, in claim 14, deviation of the image formation point on the light receiving plane of the light receiving element is detected by using a reference object, and an amount of the displacement is corrected based upon the deviation.

Kagaku et al. does not disclose or suggest the features of claim 14 of the invention.

New claim 16 is directed to an apparatus for measuring displacement of a surface of a measuring object. The apparatus comprises a light source for irradiating light; a deflector disposed between the light source and the measuring object for deflecting the light from the light source to scan the light on the surface of the measuring object at a first angle relative to the surface; a convergent lens disposed between the light source and the measuring object for converging the light from the deflector on the surface of the measuring object with the first angle; a lens array formed of plural condenser lenses and arranged in a line for converging the light reflected from the surface of the measuring object at a second angle relative to the surface different from the first angle; an imaging lens for converging the light from the lens array; and a light receiving element for receiving the light from the imaging lens converged at an image formation point on a light receiving plane thereof so that an amount of the displacement of the surface of the measuring object is obtained based upon a position of the image formation point formed on the light receiving plane using triangulation of light.

In particular, the deflector deflects the light from the light source and scans the light on the surface of the measuring object at a first angle. The lens array formed of plural condenser lenses

converges the light reflected from the surface of the measuring object at a second angle. Accordingly, the displacement of the surface of the measuring object is obtained based upon a position of the image formation point formed on the light receiving plane using triangulation of light.

In Kagaku et al., the laser beam passes through the same path between the splitter 6 and the measuring object 5, so that the first angle and the second angle are the same.

Therefore, Kagaku et al. does not disclose or suggest the features of the invention recited in claim 16.

As explained above, the features of the invention are not disclosed or suggested in the cited reference.

Reconsideration and allowance are earnestly solicited.

A one month extension of time is hereby requested. A credit card authorization form in the amount of $110.00 is attached herewith for the one month extension of time.

Respectfully submitted,

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